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U.S. Department of Energy
Idaho Operations Office

Operations and Maintenance Report for Operable Unit 5-12

August 2005

Idaho Cleanup Project

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Operations and Maintenance Report for Operable Unit 5-12

August 2005

Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This report summarizes the operations and maintenance activities performed in support of the remediation of the Waste Area Group 5 sites as delineated in the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area*. The activities were performed in accordance with the requirements outlined in the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12*. Specific activities have included the implementation and maintenance of institutional controls at the Waste Area Group 5 sites, performance of environmental monitoring activities that specifically include groundwater monitoring, and site-specific operations and maintenance activities that include the inspection and maintenance of the engineered barrier emplaced on the Stationary Low-Power Reactor No. 1 Burial Ground. These activities will continue to be performed under the purview of the Idaho Cleanup Project's Long-Term Stewardship organization until such time as they are discontinued based upon the results of a 5-year review with concurrence of the U.S. Department of Energy Idaho Operations Office, the U.S. Environmental Protection Agency, and the Idaho Department of Environmental Quality.

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ACRONYMS

ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	*Code of Federal Regulations*
CITRC	Critical Infrastructure Test Range Complex
DD&D	deactivation, decontamination, and decommissioning
DEQ	(Idaho) Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	Engineering Design File
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FY	fiscal year
ICDF	Idaho CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
MCL	maximum contaminant level
MFC	Materials and Fuels Complex
MWSF	Mixed Waste Storage Facility
ND	nondetect
NRF	Naval Reactors Facility
NSI	new site identification
O&M	operations and maintenance
OU	operable unit
PBF	Power Burst Facility

RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RTC	Reactor Technology Complex
RWMC	Radioactive Waste Management Complex
SL-1	Stationary Low-Power Reactor No. 1
SPERT	Special Power Excursion Reactor Test
TAN	Test Area North
TSF	Technical Support Facility
UCL	upper confidence limit
USC	*United States Code*
WAG	waste area group
WEDF	Waste Engineering Development Facility
WERF	Waste Experimental Reduction Facility

Operations and Maintenance Report for Operable Unit 5-12

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (DEQ), hereinafter referred to as the Agencies, DOE submits this Operations and Maintenance (O&M) Report for the Auxiliary Reactor Area (ARA) and Power Burst Facility (PBF). Under the current remediation management strategy outlined in the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991), the location is designated as Waste Area Group (WAG) 5, Operable Unit (OU) 5-12 at the Idaho National Laboratory (INL) Site (formerly known as the Idaho National Engineering and Environmental Laboratory [INEEL]).

The *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000a) describes the long-term activities and procedures required to satisfy the requirements of the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000b) concerning methods for remaining protective of human health and the environment at the WAG 5 sites. Together, the ARA and PBF areas contain 55 individual release sites, of which 15 are identified in the OU 5-12 Record of Decision (ROD) (DOE-ID 2000b) as requiring institutional controls. Institutional controls were required at the sites because the risk was greater than 1E-04 for a hypothetical current residential scenario. Because baseline risk assessments at the INL typically do not estimate risk for a current residential scenario, the potential for current residential risk in excess of 1E-04 was inferred from the risk assessment for the 100-year future residential scenario. Any sites with a 100-year future residential scenario with an estimated risk of 1E-06 or greater were assumed to pose a current residential risk of 1E-04. The 15 sites identified in the ROD (DOE-ID 2000b) as requiring institutional controls based upon these criteria include the following:

- ARA-01: ARA-I Chemical Evaporation Pond
- ARA-02: ARA-I Sanitary Waste System
- ARA-03: ARA-I Lead Sheeting Pad near ARA-627
- ARA-06: ARA-II Stationary Low-Power Reactor No. 1 (SL-1) Burial Ground
- ARA-12: ARA-III Radioactive Waste Leach Pond
- ARA-16: ARA-I Radionuclide Tank
- ARA-23: ARA-II Radiologically Contaminated Surface Soils around ARA-I and ARA-II
- ARA-24: ARA-III Windblown Soil
- ARA-25: ARA-I Soils beneath the ARA-626 Hot Cells
- PBF-10: PBF Reactor Area Evaporation Pond
- PBF-12: PBF Special Power Excursion Reactor Test (SPERT)-I Leach Pond
- PBF-13: PBF Reactor Area Rubble Pit
- PBF-21: PBF SPERT-III Leach Pond

- PBF-22: PBF SPERT-IV Leach Pond
- PBF-26: PBF SPERT-IV Lake.

Six of these 15 sites were identified as requiring remediation, including ARA-01, ARA-02, ARA-12, ARA-16, ARA-23, and ARA-25. The *Remedial Action Report for the Operable Unit 5-12 Remedial Action* (DOE-ID 2005a) has subsequently identified two sites as requiring institutional controls (ARA-07 and ARA-08), with four of the six sites remediated no longer requiring institutional controls (ARA-01, ARA-02, ARA-12, and ARA-16).

The O&M Plan (DOE-ID 2000a) outlines the activities that will be conducted at the completion of the remedial actions required for six sites under OU 5-12, including ARA-01, ARA-02, ARA-12, ARA-16, ARA-23, and ARA-25. A seventh site, ARA-06, was remediated under the *Record of Decision: Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds (Operable Units 5-05 and 6-01) and 10 No Action Sites (Operable Units 5-01, 5-03, 5-04, and 5-11)* (DOE-ID 1996).

1.1 Background

Located 51 km (32 mi) west of Idaho Falls, Idaho, INL is a government-owned, contractor-operated facility managed by the U.S. Department of Energy Idaho Operations Office (DOE-ID) (see Figure 1-1). Occupying 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain, INL encompasses portions of five Idaho counties, including Butte, Jefferson, Bonneville, Clark, and Bingham.

Comprising the ARA and PBF, WAG 5 is in the south-central portion of INL. The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the SPERT facilities, PBF consisted of five separate operational areas including the PBF Control Area, PBF Reactor Area (SPERT-I), Waste Engineering Development Facility (SPERT-II), Waste Experimental Reduction Facility (SPERT-III), and Mixed Waste Storage Facility (SPERT-IV). Collectively, the Waste Experimental Reduction Facility, Waste Engineering Development Facility, and Mixed Waste Storage Facility were known as the Waste Reduction Operations Complex.

Following the recent completion of deactivation, decontamination, and decommissioning (DD&D) activities at the PBF area, the mission has been redefined to support Homeland Security efforts, with the exception of the PBF Reactor Area, which is currently undergoing DD&D. To that end, the PBF area has been renamed as the Critical Infrastructure Test Range Complex (CITRC) to reflect this new mission.

1.2 Selected Remedy

The Agencies selected the following remedies for the Phase I and Phase II sites based upon consideration of the requirements of the detailed analysis of alternatives, public comments, and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.). Performance standards were implemented as design criteria for each site to ensure that the selected remedy is protective of human health and the environment. Five-year reviews will be used to ensure that the selected remedies remain protective and appropriate.

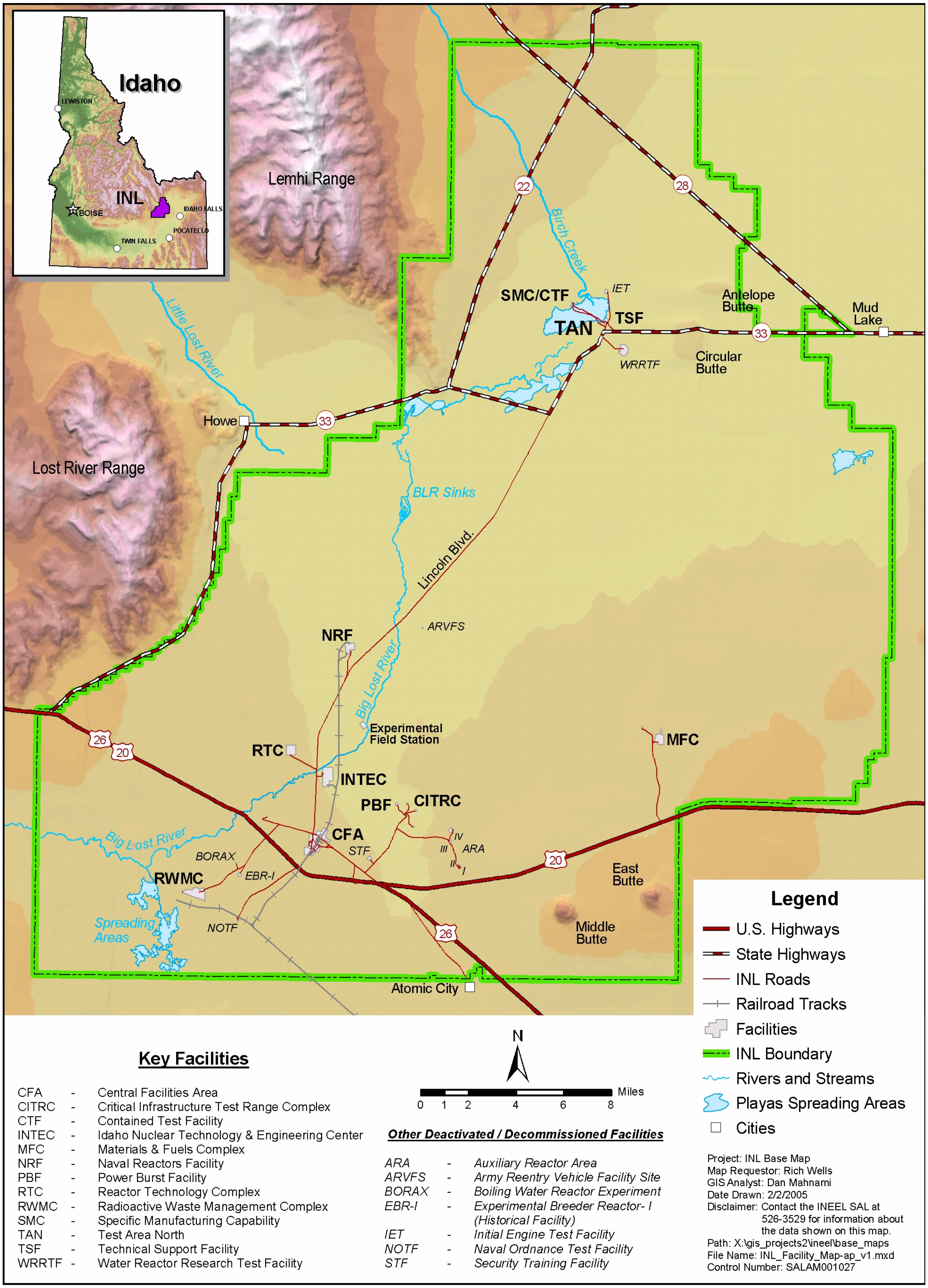


Figure 1-1. Map showing the Idaho National Laboratory Site.

1.2.1 Contaminated Soil Sites

The selected remedy for the WAG 5 contaminated soil sites was removal and disposal of the contaminated soil at INL. This remedy was selected based on the results of the comparative analysis of alternatives. Specifically, this alternative was (a) considered as having highly rated long-term effectiveness because contamination was permanently removed from the sites, (b) easily implemented because the required equipment was available, and (c) the cost-effective alternative that met the threshold criteria (i.e., the remedy provided overall protection of human health and the environment and satisfied the applicable or relevant and appropriate requirements [ARARs]). The following activities were conducted to complete the remediation of the contaminated soil sites:

- Soil contaminated with concentrations in excess of the remediation goals was removed using conventional earth-moving equipment (e.g., scrapers and backhoes).
- Real-time analyses were used before and during excavation to delineate the extent of contamination for removal. A combination of real-time analyses, field screening methods, and soil sampling and laboratory analysis were used to verify that the remediation goals have been satisfied.
- Areas excavated to depths greater than 0.3 m (1 ft) were backfilled with uncontaminated soil or sloped to promote drainage. All excavations have been contoured to match the surrounding terrain and were revegetated.
- Contaminated soil was characterized and sent to the Idaho CERCLA Disposal Facility (ICDF) for permanent disposal.
- Institutional controls consisting of signs, access controls, and land-use restrictions were maintained until remediation was completed. Post-remediation institutional control requirements are discussed in Section 3. Institutional controls identified in Section 3 will be maintained until discontinued based on the results of a 5-year review with concurrence of the Agencies.
- Five-year reviews will be conducted for remediated sites with institutional controls.

1.2.2 ARA-02 Sanitary Waste System

The selected remedy for the ARA-02 sanitary waste system was removal, ex situ thermal treatment, and disposal. This remedy was selected based on the comparative analysis of alternatives. Specifically, this alternative was (a) considered as having highly rated long-term effectiveness because contamination was permanently removed from the site and treated to reduce toxicity, mobility, and volume; (b) easily implemented because the treatment technology existed and was currently operational; and (c) the cost effective alternative that met the threshold criteria (i.e., the remedy provided overall protection of human health and the environment and satisfied the ARARs). The activities to implement this alternative included the following:

- The sludge and all components of the septic system were excavated and removed
- Structural components of the system were shipped to an acceptable facility for disposal
- Sludge was treated thermally at an approved facility with the treated residual appropriately disposed
- Soil to be excavated, the sludge in the seepage pit, and the septic tanks, piping, and pumice blocks were sampled
- Dust control and environmental monitoring were conducted during active remediation.

1.2.3 ARA-16 Radionuclide Tank

The selected remedy for the ARA-16 tank was removal of the ARA-16 radionuclide tank waste and shipment for ex situ thermal treatment and disposal. This remedy was selected based on the results of the comparative analysis of alternatives. Specifically, this alternative was (a) considered as having highly rated long-term effectiveness because contamination was permanently removed from the site and will be treated to reduce toxicity, mobility, and volume; (b) easily implemented; and (c) the cost-effective alternative that met the threshold criteria (i.e., the remedy provided overall protection of human health and the environment and satisfied the ARARs).The selected remedy consisted of the following activities:

- Waste was removed from the tank, transferred to a high-integrity container for storage, and dewatered to the extent practicable. The separated liquid phase was stabilized and sent to the ICDF for disposal. The sludge is scheduled for treatment concurrently with the Test Area North V-Tanks waste, with residuals to be disposed of at the ICDF.
- The tank and vault were excavated with the tank being encapsulated in concrete for disposal at the ICDF and the vault being disposed of at the Radioactive Waste Management Complex (RWMC). Disposal of the vault at the RWMC has been completed and the encapsulated tank is located at the Staging and Storage Annex awaiting placement in the ICDF landfill.
- Soils with Cs-137 concentrations exceeding the remediation goal were excavated and shipped to the RWMC for disposal.
- Associated piping was excavated and encapsulated in concrete and is located at the Staging and Storage Annex awaiting disposal in the ICDF landfill, tentatively scheduled for the fall of 2005.
- Appropriate sampling of the subject waste streams was performed to demonstrate that the waste met the acceptance criteria for treatment or disposal.
- Dust control and environmental monitoring were conducted during active remediation.
- The site was restored following remediation.

The *Explanation of Significant Differences for the Record of Decision for the Power Burst Facility and Auxiliary Reactor Area Operable Unit 5-12* (DOE-ID 2005b) documents a significant difference in the remedy selected in the OU 5-12 ROD (DOE-ID 2000b) for treatment of the waste contained in the ARA-16 radionuclide tank. The remedy selected in the ROD was removal, ex situ thermal treatment, and disposal. The explanation of significant differences alters the remedy for the ARA-16 tank waste to allow an alternative approach to treat this waste. Specifically, the waste will be included with the V-Tanks waste for treatment in the system developed for that much larger waste stream. Both the ARA-16 and the V-Tanks remedial actions are being performed pursuant to CERCLA and the “National Oil and Hazardous Substances Pollution Contingency Plan” (40 CFR 300). This change was needed because the thermal treatment options identified in the ROD were not available, and no other thermal treatment facility could accept the ARA-16 sludge because of the elevated radionuclide concentrations.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 History of Idaho National Laboratory

The INL, originally established in 1949 as the National Reactor Testing Station, is a DOE-managed reservation that historically has been devoted to energy research and related activities. The National Reactor Testing Station was re-designated as the Idaho National Engineering Laboratory in 1974 to reflect the broad scope of engineering activities that were being conducted at various laboratory facilities. In 1997, the Idaho National Engineering Laboratory was redesignated as the Idaho National Engineering and Environmental Laboratory, in keeping with contemporary emphasis on environmental research. In 2005, the INEEL was redesignated as Idaho National Laboratory to embody the future and important missions being accomplished today.

Historically, facilities at the INL Site were dedicated to the development and testing of peaceful applications for nuclear power. Throughout the 50 years of operations, disposal practices have been implemented in compliance with state and federal regulations and policies established by DOE and its predecessors. Some of these practices are not acceptable by contemporary standards and have been discontinued. Contaminated structures and environmental media such as soil and water are the legacy of some historical disposals. Occasional accidental releases also have occurred over time. In keeping with the contemporary emphasis on environmental issues, INL research is now focused on environmental restoration to address these contaminated media and waste management issues to minimize additional contamination from current and future operations. Spent nuclear fuel management, hazardous and mixed waste management and minimization, cultural resources preservation, and environmental engineering, protection, and remediation are challenges addressed by current INL activities (DOE-ID 1996).

2.2 History of Waste Area Group 5

As shown in Figure 1-1, ARA and PBF are located in close proximity to one another. In addition to proximity, the two areas have similar operational backgrounds and sources of contamination. Therefore, the FFA/CO (DOE-ID 1991) consolidated ARA and PBF into one waste area group for comprehensive evaluation.

The ARA-I and ARA-II facilities (see Figure 2-1) were constructed in 1957. The ARA-I facility was built to support the SL-1 located in the adjacent ARA-II facility and was the staging area for the emergency response to the 1961 SL-1 reactor accident and subsequent cleanup. The SL-1 reactor at ARA-II was operated intermittently from August 1958 until it was destroyed by a nuclear accident in January 1961 (INEEL 1995). Subsequent to decontamination following the SL-1 accident, activities at ARA-I included hot cell operations, materials research, and laboratory operations including sample preparation and inspection. The main buildings at ARA-II were converted to offices and welding shops. The ARA-II facility also housed numerous minor structures such as a guardhouse, a well house, a chlorination building, a decontamination and laydown building, a power extrapolation building, an electrical substation, and several storage tanks. The ARA-I and ARA-II facilities were formally shut down in 1988 and 1986, respectively. Decontamination and complete dismantlement were initiated and completed in 1997 for the ARA-II facility and 2000 for the ARA-I facility.

Construction of the ARA-III facility was completed in 1959 to house the Army Gas-Cooled Reactor Experiment research reactor. Experiments with the reactor continued until the plant was deactivated in 1961. In 1963, the ARA-III facility was modified to support the Mobile Low Power Reactor series of tests conducted at the ARA-IV facility and remained active until late 1965, when the Army Reactor Program was phased out. In 1969, two buildings were constructed at ARA-III to provide additional laboratory and office space in support of other INL programs. The facility was shut down in 1989. Subsequently, decontamination and complete dismantlement was initiated in 1990 and completed in 1999.

The ARA-IV facility was built to accommodate the Mobile Low Power Reactor 1, an active project from 1957 to 1964. The Nuclear Effects Reactor was operated at ARA-IV from 1967 to 1970. The area was closed down until 1975, at which time it was used temporarily for welding qualification work. Decontamination and dismantlement were performed in 1984 and 1985. Since 1985, the area had been used occasionally for testing explosives in powdered-metal manufacture experiments. A small control building, a bunker, the buried remains of two leach pits, and a sanitary waste system are all that remain. Currently, the area is being used for tests being conducted in support of the Homeland Security mission and has been redesignated as the Power Line Testing Area within the CITRC (see Figure 2-2) to reflect its new mission.

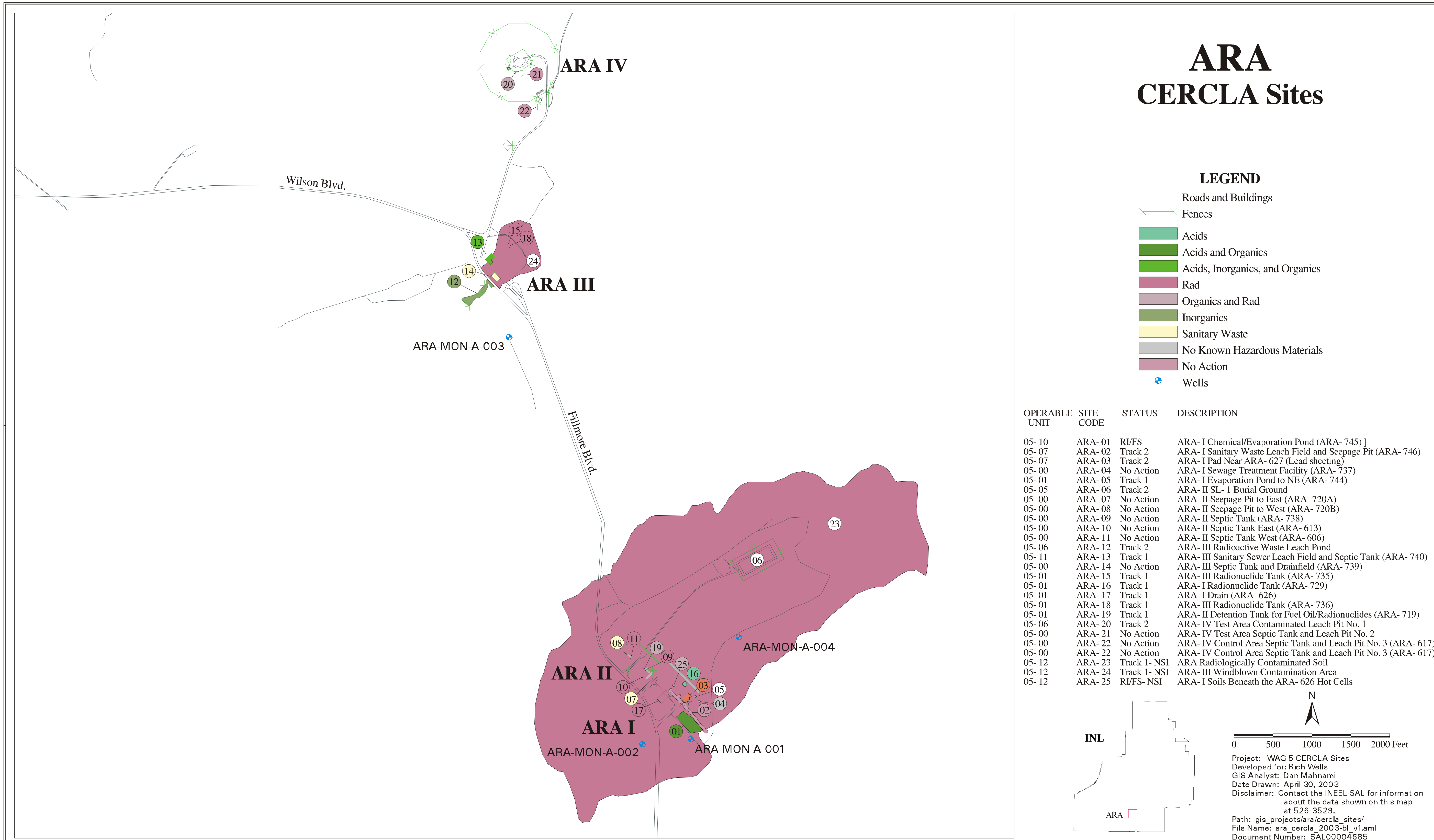
The PBF Control Area was originally built in the late 1950s for remote control of the SPERT experiments. As shown in Figure 2-3, the PBF Control Area is centrally located relative to the four SPERT facilities that surround it. The facility was greatly expanded for the PBF program, but its primary function as a support facility did not change. The facility provided raw water storage and distribution, administrative offices, instrument and mechanical work areas, and data acquisition resources. Currently, the area is primarily used for office space and has been redesignated at the CITRC Support Area to reflect the new mission for the majority of the PBF area (see Figure 2-2).

The SPERT-I reactor was operated from 1955 to 1964; it was decommissioned in 1964 and demolished in 1985. Remnants of the original SPERT-I facility, which consist of some decomposing pavement, an abandoned seepage pit, and an old leach pond, remain in the vicinity. The PBF reactor was constructed in 1972 just north of the remains of the SPERT-I facility. The PBF reactor was placed in standby in 1985 and is currently being decommissioned and dismantled. All fuel was removed from the facility in 2003 and placed in approved storage at the Idaho Nuclear Technology and Engineering Center (INTEC). Many of the structures in the area have been or are being removed, including the maintenance and storage building, the cooling tower, two electrical substations, and numerous smaller buildings and structures.

The Waste Engineering Development Facility (WEDF), originally built to contain the SPERT-II reactor, was constructed in the late 1950s. The SPERT-II reactor was operational from 1960 to 1964. After the reactor was removed, the facility was converted for research purposes. These activities included waste treatment development and laboratory operations. Other structures in the area include an electrical substation, a leach pond, a seepage pit, and underground tanks. The area also is used for temporary storage of uncontaminated lead stored outside in cargo containers stacked on asphalt pads. The facility has been redesignated as the Special Programs Facility to reflect its new mission within the CITRC (see Figure 2-2).

The Waste Experimental Reduction Facility (WERF) building was originally constructed in the 1950s to contain the SPERT-III reactor, which was operational from 1958 to 1968. The reactor building was decontaminated in 1980, and the building was modified to contain the WERF, which began operation in 1982. Final shutdown of the incinerator located at WERF occurred in 2000. The area underwent decontamination and partial dismantlement in 2002 to 2003; this activity included the removal of the incinerator and supporting facilities. The facility has been redesignated as the Large Scale Development Facility to reflect its new mission within the CITRC (see Figure 2-2).

The Mixed Waste Storage Facility (MWSF) originally housed the SPERT-IV reactor, which was operational from 1961 to 1970. After the reactor was removed, the building was modified slightly and converted to a waste storage facility with capabilities to repackage waste. Mixed low-level waste, including radioactively contaminated polychlorinated biphenyl waste, was stored in the former reactor pit. The area has subsequently undergone decontamination with dismantlement of the repackaging capabilities under terms of an RCRA closure and has been redesignated as the Contraband Detection Facility to reflect its new mission within the CITRC. The area also contains an electrical substation, a leach pond, and underground tanks.



OPERABLE UNIT	SITE CODE	STATUS	DESCRIPTION
05- 10	ARA- 01	RI/FS	ARA- I Chemical/Evaporation Pond (ARA- 745)]
05- 07	ARA- 02	Track 2	ARA- I Sanitary Waste Leach Field and Seepage Pit (ARA- 746)
05- 07	ARA- 03	Track 2	ARA- I Pad Near ARA- 627 (Lead sheeting)
05- 00	ARA- 04	No Action	ARA- I Sewage Treatment Facility (ARA- 737)
05- 01	ARA- 05	Track 1	ARA- I Evaporation Pond to NE (ARA- 744)
05- 05	ARA- 06	Track 2	ARA- II SL- 1 Burial Ground
05- 00	ARA- 07	No Action	ARA- II Seepage Pit to East (ARA- 720A)
05- 00	ARA- 08	No Action	ARA- II Seepage Pit to West (ARA- 720B)
05- 00	ARA- 09	No Action	ARA- II Septic Tank (ARA- 738)
05- 00	ARA- 10	No Action	ARA- II Septic Tank East (ARA- 613)
05- 00	ARA- 11	No Action	ARA- II Septic Tank West (ARA- 606)
05- 06	ARA- 12	Track 2	ARA- III Radioactive Waste Leach Pond
05- 11	ARA- 13	Track 1	ARA- III Sanitary Sewer Leach Field and Septic Tank (ARA- 740)
05- 00	ARA- 14	No Action	ARA- III Septic Tank and Drainfield (ARA- 739)
05- 01	ARA- 15	Track 1	ARA- III Radionuclide Tank (ARA- 735)
05- 01	ARA- 16	Track 1	ARA- I Radionuclide Tank (ARA- 729)
05- 01	ARA- 17	Track 1	ARA- I Drain (ARA- 626)
05- 01	ARA- 18	Track 1	ARA- III Radionuclide Tank (ARA- 736)
05- 01	ARA- 19	Track 1	ARA- II Detention Tank for Fuel Oil/Radionuclides (ARA- 719)
05- 06	ARA- 20	Track 2	ARA- IV Test Area Contaminated Leach Pit No. 1
05- 00	ARA- 21	No Action	ARA- IV Test Area Septic Tank and Leach Pit No. 2
05- 00	ARA- 22	No Action	ARA- IV Control Area Septic Tank and Leach Pit No. 3 (ARA- 617)
05- 00	ARA- 22	No Action	ARA- IV Control Area Septic Tank and Leach Pit No. 3 (ARA- 617)
05- 12	ARA- 23	Track 1- NSI	ARA Radiologically Contaminated Soil
05- 12	ARA- 24	Track 1- NSI	ARA- III Windblown Contamination Area
05- 12	ARA- 25	RI/FS- NSI	ARA- I Soils Beneath the ARA- 626 Hot Cells

Figure 2-1. Auxiliary Reactor Area.

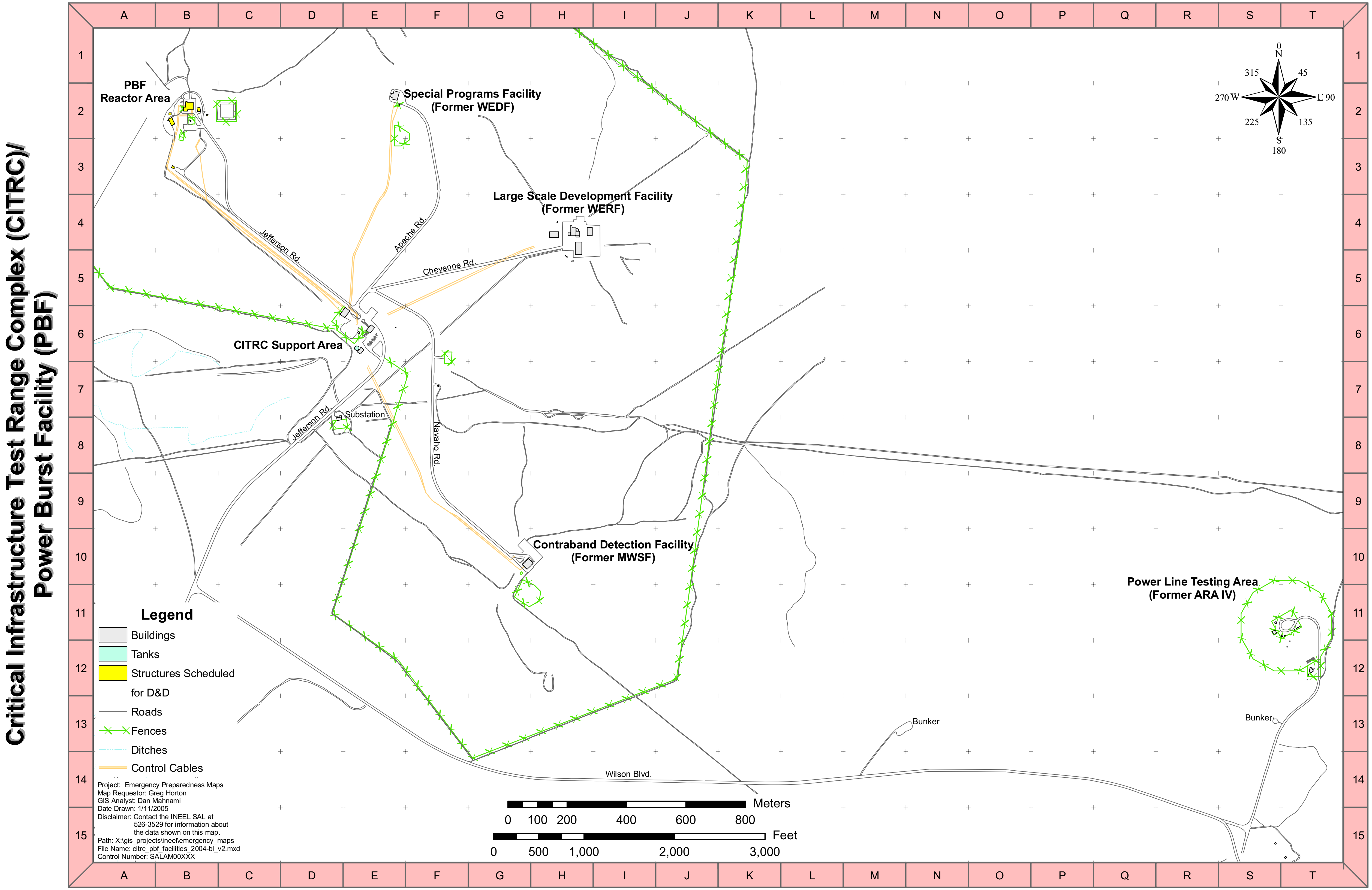
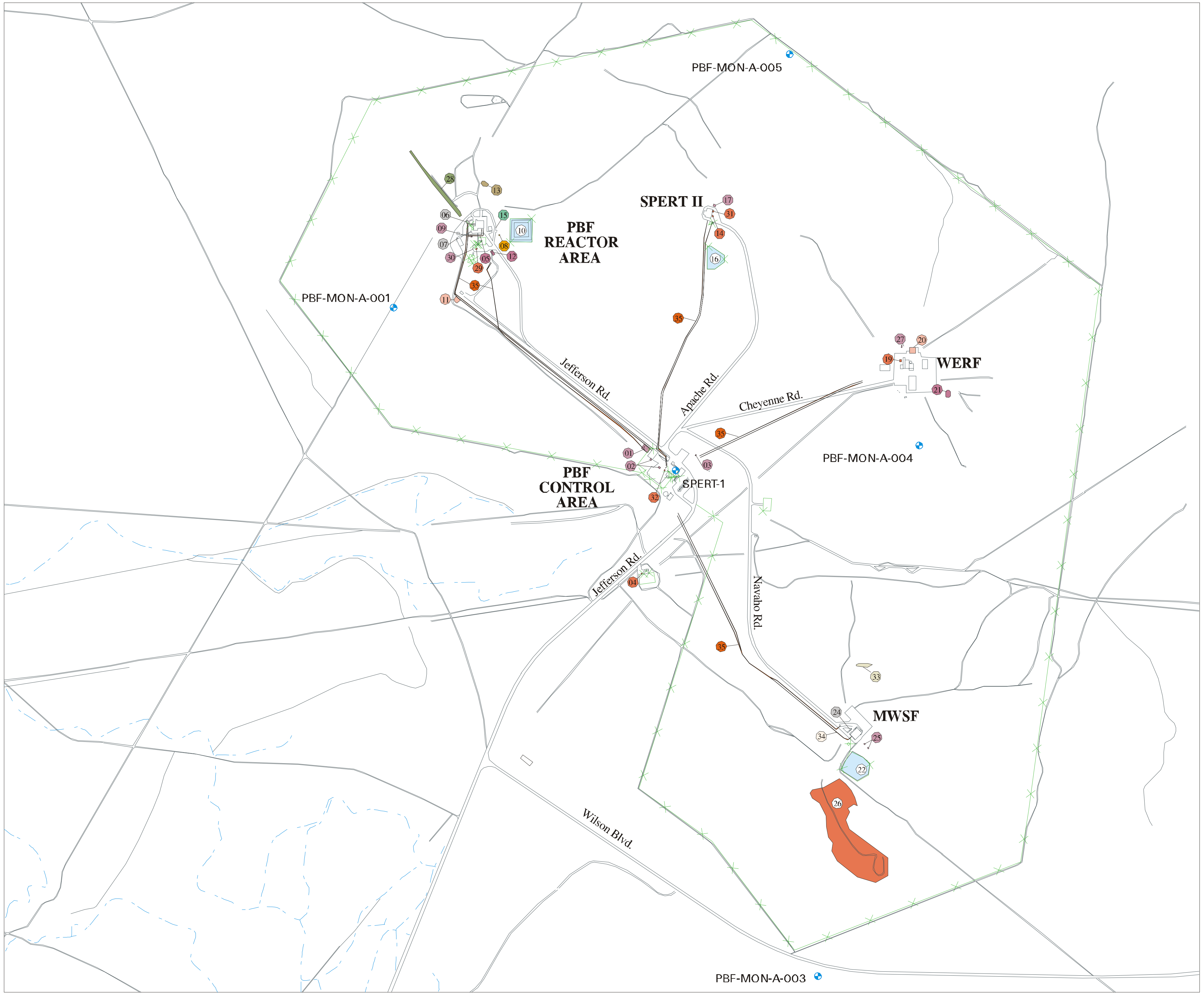


Figure 2-2. Critical Infrastructure Test Range Complex.

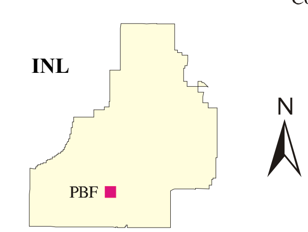


PBF
CERCLA Sites

LEGEND

Roads and Buildings
Fences
Ditches
Acids
Acids and Bases
Acids, Bases, and Inorganics
Rad
Fuel Oil and Rad.
Metals and Rad
Inorganics
Inorganics, Organics, and Rad
No Known Hazardous Materials
PCBs
Debris
Construction Debris
Construction, Inorganics
No Action
Wells

OPERABLE UNIT	SITE CODE	STATUS	DESCRIPTION
05- 00	PBF- 01	No Action	PBF Control Area Septic Tank (PBF- 724), Seepage Pit (PBF- 735)
05- 00	PBF- 02	No Action	PBF Control Area Septic Tanks (PBF- 738,739), Seepage Pit (PBF- 736)
05- 00	PBF- 03	No Action	PBF Control Area Septic Tank for PBF- 632 and Seepage Pits (PBF- 745,748)
05- 04	PBF- 04	Track 1	PBF Control Area Oil Tank at PBF- 608 (substation) outside PBF fence
05- 08	PBF- 05	Track 2	PBF Reactor Area Warm Waste Injection Well (PBF- 301)
05- 03	PBF- 06	Track 1	PBF Reactor Area Blowdown Pit for Reactor Boiler by PBF- 621
05- 03	PBF- 07	Track 1	PBF Reactor Area Oil Drum Storage (PER- T13)
05- 13	PBF- 08	Interim Action	PBF Reactor Area Corrosive Waste Disposal Sump Brine Tank (PBF- 731)
05- 00	PBF- 09	No Action	PBF Reactor Area Septic Tank and Drainfield (PBF 728)
05- 13	PBF- 10	Interim Action	PBF Reactor Area Evaporation Pond (PBF- 733)
05- 08	PBF- 11	Track 2	PBF SPERT I Seepage Pit (PBF- 750)
05- 02	PBF- 12	Track 1	PBF SPERT I Leach Pond
05- 03	PBF- 13	Track 1	PBF Reactor Area Rubble Pit
05- 04	PBF- 14	Track 1	PBF SPERT II Inactive Fuel Oil Tank (front of PBF- 612)
05- 08	PBF- 15	Track 2	PBF Reactor Area Corrosive Waste Injection Well (PBF- 302)
05- 09	PBF- 16	Track 2	PBF SPERT II Leach Pond
05- 00	PBF- 17	No Action	PBF SPERT II Septic Tank and Seepage Pit (PBF 725)
05- 04	PBF- 19	Track 1	PBF SPERT III Inactive Fuel Oil Tank at PBF- 609 (west side of WERF)
05- 09	PBF- 20	Track 2	PBF SPERT III Small Leach Pond
05- 02	PBF- 21	Track 1	PBF SPERT III Large Leach Pond
05- 09	PBF- 22	Track 2	PBF SPERT IV Leach Pond (PBF- 758)
05- 03	PBF- 24	Track 1	PBF SPERT IV Blowdown Pit (adjacent to PBF- 716)
05- 00	PBF- 25	No Action	PBF SPERT IV Septic Tank and Leach Pit (PBF 727 and 757)
05- 02	PBF- 26	Track 1	PBF SPERT IV SPERT Lake (adjacent to PBF- 758)
05- 00	PBF- 27	No Action	PBF SPERT III Septic Tank (PBF- 726) and Seepage Pit
05- 03	PBF- 28	Track 1	PBF Cooling Tower Area and Drainage Ditch
05- 12	PBF- 29	Track 1- NSI	PBF Reactor Area Abandoned Fuel Oil Tank
05- 12	PBF- 30	Track 1- NSI	PBF Reactor Area Abandoned Septic System
05- 12	PBF- 31	Track 1- NSI	SPERT II Fuel Oil Tank
05- 12	PBF- 32	Track 1- NSI	PBF Control Area Fuel Oil Tank
10- 08	PBF- 33	Track 1	Abandoned Debris Trench
10- 08	PBF- 34	Track 1	Abandoned Debris Located Near the MWSF
10- 08	PBF- 35	Track 1/NSI	Abandoned Power & Control Cables between buildings at the PBF Complex (PBF Reactor Area Control Cables)



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Project: WAG 5 CERCLA Sites
Developed for: Rich Wells
GIS Analyst: Dan Mahnami
Date Drawn: March 28, 2005
Disclaimer: Contact the INEEL SAL for information about the data shown on this map at 526-3529.
Path: ' '
File Name: pbf_cercla_2003-bl_v1.aml
Document Number: SAL00001138

Figure 2-3. Power Burst Facility.

3. INSTITUTIONAL CONTROLS

Subsequent to the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000b), the 15 sites listed in Section 1 were identified as requiring institutional controls. Institutional controls were implemented at the WAG 5 sites as outlined in the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5*-12 (DOE-ID 2000a). Following the completion of the OU 5-12 Phase I activities, and as documented in the *Remedial Action Report for the Operable Unit 5-12 Remedial Action* (DOE-ID 2005a), institutional controls were implemented at ARA-07 and ARA-08 because of residual radiological contamination. Also, as documented in the Remedial Action Report (DOE-ID 2005a), institutional controls will no longer be required at Sites ARA-01, ARA-02, ARA-12, and ARA-16. Institutional controls, where required, will continue to be maintained in accordance with the requirements outlined in the *INEEL Sitewide Institutional Controls Plan* (DOE-ID 2004a). The following sections discuss the institutional controls as required following the completion of the remedial actions.

3.1 ARA-03: ARA-I Lead Sheeting Pad near ARA-627

The estimated baseline risk for the ARA-03 site is 2E-05 for the 100-year future residential scenario from exposure to Cs-137 (DOE-ID 1999) with analytical results ranging from 0.49 to 7.4 pCi/g for samples obtained September 27, 1994. Based upon this risk, the OU 5-12 ROD (DOE-ID 2000b) provides recommendation that the site be restricted to industrial land use until institutional controls are discontinued based on the results of a 5-year review. The 1994 data set was evaluated for normality using the Shapiro-Wilk test statistic, which indicated that the data were normally distributed at the 5% significance level. The 95% upper confidence limit (UCL) for the data set using the Student's t was 5.00 pCi/g, which equates to 3.94 pCi/g when decay corrected to January 24, 2005. The allowable Cs-137 concentration for the current residential scenario below which institutional controls would not be required is 2.4 pCi/g (Fromm 1996) for 1E-04 risk. Based upon this concentration, institutional controls will remain in effect for ARA-03 until January 2036.

3.2 ARA-06: ARA-II Stationary Low-Power Reactor No. 1 Burial Ground

The ARA-06 site is a low-level radioactive waste landfill with an estimated baseline risk of 1E-01 for the 100-year future residential scenario from exposure to radiologically contaminated soil and waste, diminishing to 1E-04 in approximately 400 years (INEEL 1995). The implemented remedial action includes an engineered barrier. Land-use controls will be maintained at ARA-06 to inhibit intrusion into the buried waste. Surface contamination in the vicinity of the ARA-06 burial ground was addressed by the remediation of ARA-23. Table 3-1 provides the estimated concentrations for various potential radionuclide contaminants of concern in the waste buried at ARA-06. Institutional controls will be maintained at the site until discontinued based on the results of a 5-year review. Recommendations for appropriate land-use restrictions will accompany any land transfer.

Table 3-1. Subsurface concentrations for contaminants in the SL-1 Burial Ground (ARA-06).

Radionuclide	Concentration (pCi/g)		
	July 1994	July 2094 (decay corrected)	July 2394 (decay corrected)
Cesium-137	2.29E+04	2.28E+03	2.27E+00
Strontium-90	2.15E+04	1.94E+03	1.41E+00
Krypton-85	6.91E+02	1.11E+00	4.58E-09
Samarium-151	5.20E+02	2.41E+02	2.39E+01
Promethium-147	2.62E+01	8.78E-11	3.30E-45
Plutonium-241	1.96E+01	1.56E-01	7.96E-08
Europium-154	1.84E+01	5.78E-03	1.79E-13
Europium-155	1.24E+01	5.90E-06	6.35E-25
Plutonium-239	1.04E+01	1.04E+01	1.03E+01
Technetium-99	6.85E+00	6.85E+00	6.84E+00
Plutonium-238	6.72E+00	3.05E+00	2.85E-01
Americium-241	2.57E+00	2.76E+00	1.71E+00
Plutonium-240	1.56E+00	1.54E+00	1.50E+00
Zirconium-93	1.04E+00	1.04E+00	1.04E+00

3.3 ARA-07: ARA-II Seepage Pit to East (ARA-720A)

The ARA-07 site is a seepage pit located to the east of the former ARA-II facility site. This site has residual risk attributed to the presence of Cs-137 at a concentration exceeding the 1E-04 for the 100-year future residential scenario for external exposure. The site will be restricted to industrial land use until discontinued based on the results of a 5-year review. For ARA-07, the historical maximum Cs-137 concentration was 17.6 pCi/g obtained in June 1991. Based upon this concentration, institutional controls will remain in effect for approximately 87 years from the June 1991 analysis date, or until June 2078 to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996).

3.4 ARA-08: ARA-II Seepage Pit to West (ARA-720B)

The ARA-08 site is a seepage pit located to the west of the former ARA-II facility. This site has residual risk attributed to the presence of Cs-137 at a concentration exceeding the 1E-04 for the 100-year future residential scenario for external exposure. The site will be restricted to industrial land use until discontinued based on the results of a 5-year review. For ARA-08, the historical maximum Cs-137 concentration was 11.6 pCi/g obtained in June 1991. Based upon this concentration, institutional controls will remain in effect for approximately 68.5 years from the June 1991 analysis date, or until December 2059 to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996).

3.5 ARA-23: ARA-II Radiologically Contaminated Soils around ARA-I and ARA-II

The ARA-23 site was restricted to industrial land use until remediation was implemented, as prescribed in the OU 5-12 ROD, with land-use controls not being required after remediation if all contaminated soil is removed to basalt or if contaminant concentrations are comparable to local background values. For remediation purposes, the ARA-23 site was divided into five zones based upon the depositional mode of contamination. These five zones include ARA-I, ARA-II, the equipment washdown area, the haul road and turnaround area, and the windblown area. Table 3-2 summarizes the 95% UCL concentrations for the Cs-137 concentrations obtained from both the in situ and the analytical laboratory data sets. The timeframe for institutional controls is provided based upon the calculated time required for the Cs-137 to decay to the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996). Institutional controls will be maintained until discontinued based on the results of a 5-year review.

Table 3-2. ARA-23 Cs-137 concentrations.

Area	Cs-137 Concentration (pCi/g)		Decay Time (yrs)	
	In Situ	Laboratory	In Situ	Laboratory
ARA-I	8.5	22.3	55.0	97.0
ARA-II area not excavated to basalt	8.6	11.1	55.6	66.7
ARA-II area excavated to basalt	52.1	83.8	134.0	154.6
Equipment washdown area	8.39	12.86	54.5	73.1
Haul road and turnaround area	7.4	9.5	49.0	59.9
Windblown area	9.3	9.6	59.0	60.3

Based upon the calculated decay time for the various areas within ARA-23, institutional controls will be required for up to 155 years for the area immediately within ARA-II that was excavated to basalt. Other areas of ARA-23 may be released from institutional controls in a shorter time frame if desired and agreed upon with the Agencies.

3.6 ARA-24: ARA-III Windblown Soil

For the ARA-24 site, land use will be restricted to prohibit potential exposure to radiologically contaminated material, specifically a contaminated pipeline embedded in concrete 20 ft below grade. As presented in Engineering Design File (EDF) ER-WAG5-104 provided in Appendix J of the *Waste Area Group 5, Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (DOE-ID 1999), an in situ survey of the surface soils completed in September 1997 at the ARA-24 site demonstrated that the Cs-137 contamination in the vicinity of the ARA-II facility was less than 5 pCi/g. Elevated levels of gamma-emitting radionuclides were identified in the vicinity of the ARA-12 pond, but not the facility area itself. Samples of the pipe contents were not obtained during the decontamination and dismantlement of the facility. Based solely on the in situ survey results for the surface soils being less than 5 pCi/g, institutional controls would be required for a minimum of 32 years from the date of analysis (or until 2029) to allow for decay to the 2.4 pCi/g concentration required for free release (Fromm 1996). However, the presence of the contaminated piping will most likely drive the requirement for institutional controls for a longer period of time. Institutional controls will be maintained at ARA-24 until discontinued based on the results of a 5-year review. Recommendations for appropriate land-use restrictions will accompany any land transfer.

3.7 ARA-25: ARA-I Soils beneath the ARA-626 Hot Cells

The ARA-25 site consists of soils beneath the former location of the Building ARA-626 Hot Cells at the ARA-I facility. The site was to be restricted to industrial land use until remediation was implemented as prescribed in the OU 5-12 ROD. The remediation of the ARA-25 site resulted in the removal of contaminated soils to basalt. In situ measurements of the basalt layer demonstrated that the maximum Cs-137 concentration remaining was 398 pCi/g, which exceeds the remediation goal of 23 pCi/g at the 1E-04 human health risk concentration for the residential 100-year scenario decayed through the exposure period. The Cs-137 was used as a marker to calculate the concentrations of the remaining contaminants based on the ratio of their maximum concentrations to that of Cs-137, as obtained from Tables 13 and 14 in the OU 5-12 ROD (DOE-ID 2000b). The concentration of Cs-137 and those derived for the other contaminants of concern are provided in Table 3-3.

Table 3-3. ARA-25 contaminant concentrations.

Contaminant of Concern	Maximum Concentration prior to Remediation	Remediation Goal	Maximum Post-Remediation Concentration
Cs-137	449 pCi/g	23 pCi/g	398 pCi/g
Ra-226	29.7 pCi/g	1.2 or 2.1 pCi/g[a]	26.3 pCi/g
Arsenic	40.6 mg/kg	5.8 mg/kg	36.0 mg/kg
Lead	1,430 mg/kg	400 mg/kg	1,266 mg/kg
Copper	227 mg/kg	220 mg/kg	201 mg/kg

a. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235; otherwise, a goal of 1.2 pCi/g will be used. Regardless of which remediation goal concentration is used for comparison, the post-remediation concentration exceeds either one.

Contaminant concentrations above the remediation goals remained at the site in the basalt fissures; therefore, institutional controls remain in effect. Based just upon the Cs-137 results that were obtained in September 2001, institutional controls will be required for a minimum of 222 years to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996). The impact of the longer half-life of Ra-226 (1,600 yrs) will be greater. Institutional controls will be maintained at ARA-25 until discontinued based on the results of a 5-year review.

3.8 PBF-10: PBF Reactor Area Evaporation Pond (PBF-733)

For the PBF-10 site, an interim action was implemented to remove chromium and Cs-137 contamination (Parsons 1995). Based on samples collected following completion of the interim action, institutional controls were implemented because the post-remediation estimated baseline risk was 2E-05 for the 100-year future residential scenario from exposure to Cs-137. The Cs-137 concentrations for the soils above the pond liner ranged from 11.17 to 17.5 pCi/g. The data collected are normally distributed; therefore, a 95% Student's t UCL was calculated resulting in a concentration of 15.8 pCi/g. Based upon this concentration, institutional controls will remain in effect for approximately 82.0 years from the sampling date of August 18, 1994, or until August 2076 to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996).

3.9 PBF-12: PBF SPERT-I Leach Pond

The PBF-12 site is a surface impoundment that received waste related to the SPERT-I facility. The OU 5-12 ROD (DOE-ID 2000b) required that institutional controls be implemented because of a 100-year future residential risk of 2E-05 from exposure to Cs-137. The Cs-137 concentrations from the 1984 Decontamination and Dismantlement sampling activity ranged from 0.57 to 31.4 pCi/g with an average of 8.03 pCi/g and a standard deviation of 9.26. The calculated 95% UCL based upon the data following a gamma distribution is 16.37 pCi/g. Given this concentration, institutional controls will remain in effect for approximately 83.6 years from the date of analysis, assumed to be December 1984 to be conservative. The site will be restricted to industrial land use until August 2068 to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996).

3.10 PBF-13: PBF Reactor Area Rubble Pit

The PBF-13 site is a rubble pit located north of the former location of the PBF Reactor Area cooling tower that was demolished in 2004. It received soil and basalt pieces excavated during construction of the facility in the late 1960s and was used as a dump for a variety of construction materials in the mid-1970s. The OU 5-12 ROD (DOE-ID 2000b) implemented institutional controls to control land use in an effort to prohibit potential exposure to friable asbestos. The existing institutional controls are augmented with signs, a monument, and maintenance of the existing cover. Institutional controls will be maintained until discontinued based on the results of a 5-year review. Recommendations for appropriate land-use restrictions will accompany any land transfer.

3.11 PBF-21: PBF SPERT-III Large Leach Pond

The PBF-21 site is the historical location of a leach pond that received waste from the sump pump in the SPERT-III Reactor Building from 1958 to 1968. In accordance with the OU 5-12 ROD (DOE-ID 2000b), institutional controls were implemented for this site because the estimated risks are 1E-05 for the 100-year future residential scenario from exposure to radionuclides. Table 3-4 lists the radionuclides detected during the 1982 characterization conducted by the decontamination and dismantlement program prior to backfilling the pond. The table includes the range, average, 95% UCL (including the data distribution), and the 1E-04 current residential scenario concentrations (Fromm 1996) for each of the reported radionuclides.

Table 3-4. PBF-21 radionuclide concentrations.

Radionuclide	Range (pCi/g)	Average (pCi/g)	95% UCL (pCi/g)	Current Residential Scenario (pCi/g)
Cobalt-60	0.0471 – 3.22	0.77	1.58 (gamma)	1.6 (external exposure)
Cesium-137	0.0819 – 14	3.33	18.4 (99% Chebyshev)	2.4 (external exposure)
Plutonium-239	0.05 – 0.065	0.060	N/A	250 (soil ingestion)
Strontium-90	0.153 – 0.46	0.30	0.471 (Student's t)	210 (soil ingestion)
Uranium-234	0.3 – 1.63	0.88	1.31 (Student's t)	1800 (soil ingestion)
Uranium-235	0.051 – 0.075	0.064	N/A	13 (external exposure)
Uranium-238	0.5 – 1.46	0.88	1.18 (Student's t)	67 (external exposure)

N/A = not applicable
UCL = upper confidence limit

For Pu-239 and U-235, too few sample results were available from which to calculate the 95% UCL. Therefore, the maximum concentration detected will be used for comparison to the current residential scenario concentration. Both the Pu-239 and U-235 maximum concentrations (0.065 and 0.075 pCi/g, respectively) are below the corresponding current residential scenario concentrations of 250 and 13 pCi/g. For Co-60, Sr-90, U-234, and U-238, the 95% UCL concentrations for each are less than the current residential scenario concentrations as provided in Table 3-4. Based upon these comparisons, the presence of one of these radionuclides is cause for institutional control restrictions on this site. Cesium-137 is the one radionuclide with a 95% UCL concentration of 18.4 pCi/g that exceeds the current residential scenario concentration of 2.4 pCi/g, thereby requiring the continuation of institutional controls for the PBF-21 site. Based upon this concentration, institutional controls will remain in effect for approximately 88.7 years from the estimated analytical date of December 31, 1982, or until September 2071, to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996). This site will be restricted to industrial land use until the institutional controls are discontinued based on the results of a 5-year review.

3.12 PBF-22: PBF SPERT-IV Leach Pond (PBF-758)

The PBF-22 site was the location of an unlined surface impoundment that received effluent from the SPERT-IV reactor from 1961 to 1970. Occasional discharges from the SPERT-IV waste holdup tank were routed to the pond from 1979 to 1981 and contaminated primary coolant effluents from the PBF Reactor were transported to the site by truck and emptied into the pond in the early 1980s. Based upon the results of two separate characterization events performed in 1988, institutional controls were implemented at the site based upon exposure risks being 9E-06 for Cs-137 for the current occupational scenario, and 3E-06 for the 100-year future residential scenario as outlined in the OU 5-12 ROD (DOE-ID 2000b). The Cs-137 results ranged from 0.073 to 8.0 pCi/g with an average of 1.10 pCi/g. The 99% Chebyshev UCL (used because the data follow a non-parametric distribution) is 4.42 pCi/g. Based upon this concentration, institutional controls will remain in effect for approximately 26.6 years from an estimated analytical date of December 31, 1988, or until August 2015. The site will be restricted to industrial land use until the institutional controls are discontinued based on the results of a 5-year review.

3.13 PBF-26: PBF SPERT-IV Lake

The PBF-26 site is a surface impoundment area constructed in 1960 around an irregularly shaped natural depression. The area typically received small quantities of uncontaminated cooling water from the secondary loop of the SPERT-IV reactor from 1961 to 1970, uncontaminated effluent from Three Mile Island studies, and discharges generated by periodic testing of emergency eye wash and shower stations from 1985 to 1992. The discharges were believed to be uncontaminated, but subsequent sampling demonstrated that low-level radionuclide contamination was present at the site. The site is restricted to industrial land use because of estimated baseline risks of 7E-05 for the current occupational scenario and 6E-05 for the 100-year future residential scenario from exposure to radionuclides (Cs-137, U-235, and U-238). Table 3-5 lists the radionuclides detected during the 1985 sampling event, including the range, average, 95% UCL (including the data distribution), and the 1E-04 current residential scenario concentrations (Fromm 1996) for the three radionuclides of concern.

Table 3-5. PBF-26 radionuclide concentrations.

Radionuclide	Range (pCi/g)	Average (pCi/g)	95% UCL (pCi/g)	Current Residential Scenario (pCi/g)
Cesium-137	0.70 – 7.69	2.79	4.67 (Student's t)	2.4 (external exposure)
Uranium-235	0.80	N/A	N/A	13 (external exposure)
Uranium-238	0.80 – 3.4	2.1	N/A	67 (external exposure)

N/A = not applicable
UCL = upper confidence limit

For U-235 and U-238, too few sample results were available from which to calculate the 95% UCL. Therefore, the maximum concentration detected will be used for comparison to the current residential scenario concentration. Both the U-235 and U-238 maximum concentrations (0.80 and 3.4 pCi/g, respectively) are below the corresponding current residential scenario concentrations of 13 and 67 pCi/g. Based upon these comparisons, the presence of neither of these radionuclides is cause for institutional control restrictions on the site. Cesium-137 with a 95% UCL concentration of 4.67 pCi/g exceeds the current residential scenario concentration of 2.4 pCi/g, thereby requiring the continuation of institutional controls for the PBF-26 site. Based upon this concentration, institutional controls will remain in effect for approximately 26.6 years from the estimated analytical date of December 31, 1985, or until August 2012 to achieve the 2.4 pCi/g concentration for the current residential scenario (Fromm 1996). The site will be restricted to industrial land use until the institutional controls are discontinued based on the results of a 5-year review.

4. ENVIRONMENTAL MONITORING

Groundwater monitoring is being conducted in partial fulfillment of the requirements delineated in the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000b). Groundwater samples are collected and analyzed in accordance with the requirements provided in the *Groundwater Monitoring Plan for the Waste Area Group 5 Remedial Action* (DOE-ID 2004b). As required by the OU 5-12 ROD (DOE-ID 2000b), groundwater monitoring is being conducted at WAG 5 to reduce the uncertainties associated with previous sampling efforts. Specifically, samples have been collected to monitor the Snake River Plain Aquifer beneath the WAG 5 site to confirm that surface contaminants have not adversely affected the groundwater. Samples have been collected for additional analyses to provide data in support of the 5-year review for WAG 5 and the WAG 10 OU 10-08 evaluation of the Snake River Plain Aquifer.

As outlined in the Groundwater Monitoring Plan (DOE-ID 2004b), samples have been collected from nine aquifer wells in the vicinity of WAG 5 (see Figure 4-1). Samples were analyzed for radionuclides (gross alpha, gross beta, iodine-129, tritium, and gamma-emitting radionuclides), volatile organic constituents, and inorganic constituents (metals and anions). Each of the wells is sampled on an annual basis, with the occasional exception of a well not being sampled because of problems with a pump. In addition, water level measurements are collected from 19 wells within or near WAG 5 with the results used to develop groundwater contour maps (see Figure 4-2 for the most recent map). Table 4-1 summarizes the analytical data for the primary radionuclides, metals, and anions that have been monitored since 1997.

Table 4-1. Analytical data summary.

Analyte	Maximum	Minimum	Maximum Contaminant Level (MCL)
Radionuclides (pCi/L)			
Gross alpha	4.54	ND[a]	15
Gross beta	5.145	ND	4 mrem/yr
Tritium	2,381	ND	20,000
Iodine-129	0.678	ND	1
Metals (µg/L)			
Arsenic	9	ND	10
Barium	59.5	25.2	2,000
Cadmium	2.3	ND	5
Chromium	37	ND	100
Lead	75.7	ND	15
Selenium	14.7	ND	50
Anions			
Chloride	29.3	12.4	250[b]
Fluoride	0.546	ND	4[c]
Nitrate	6	ND	10
Sulfate	26.1	16.18	250[b]

a. ND = nondetect.
b. Concentration represents the EPA-defined secondary standard for this contaminant.
c. A 2 mg/L secondary standard exists in addition to the MCL.

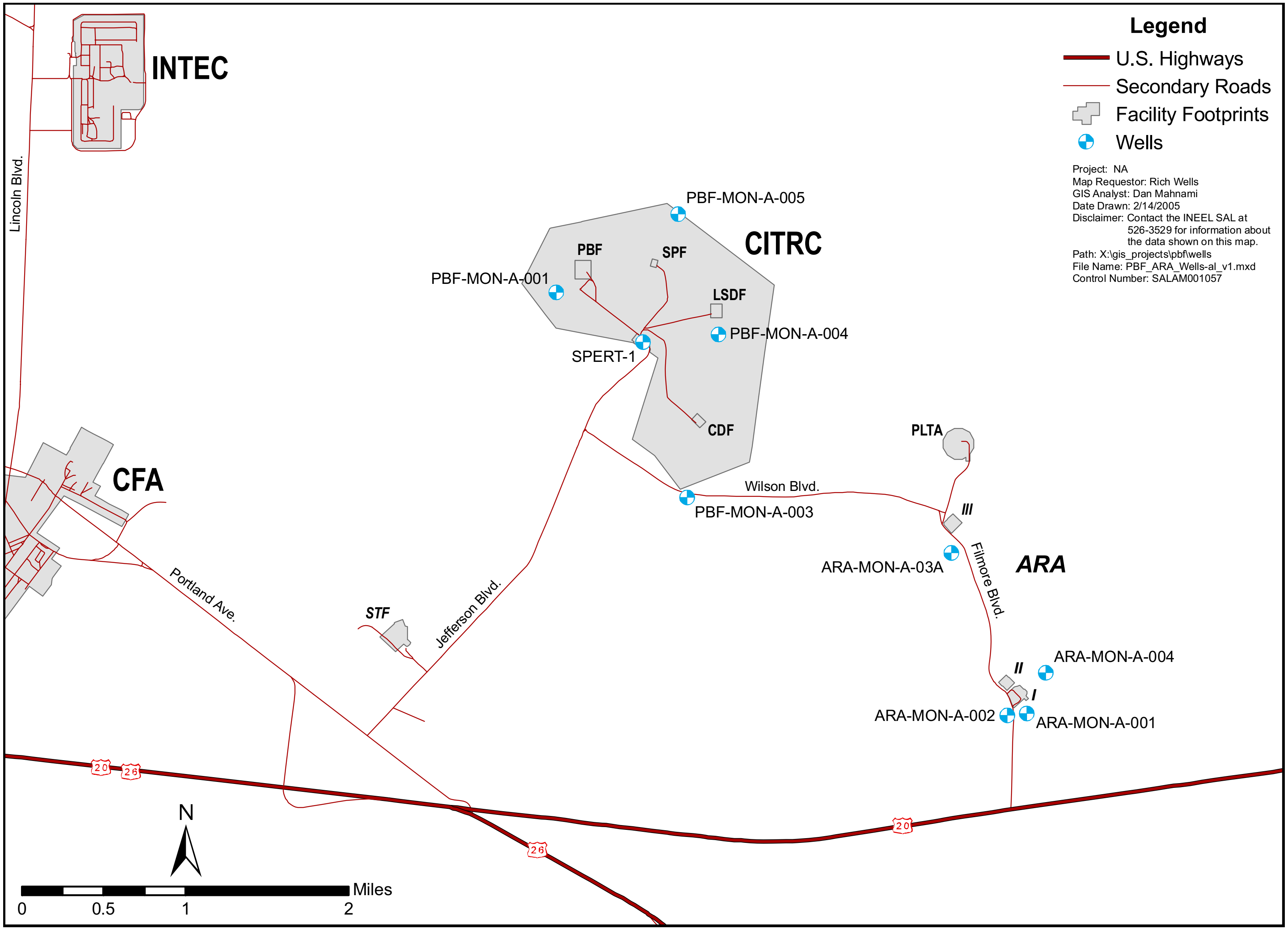

Figure 4-1. Waste Area Group 5 monitoring well locations.

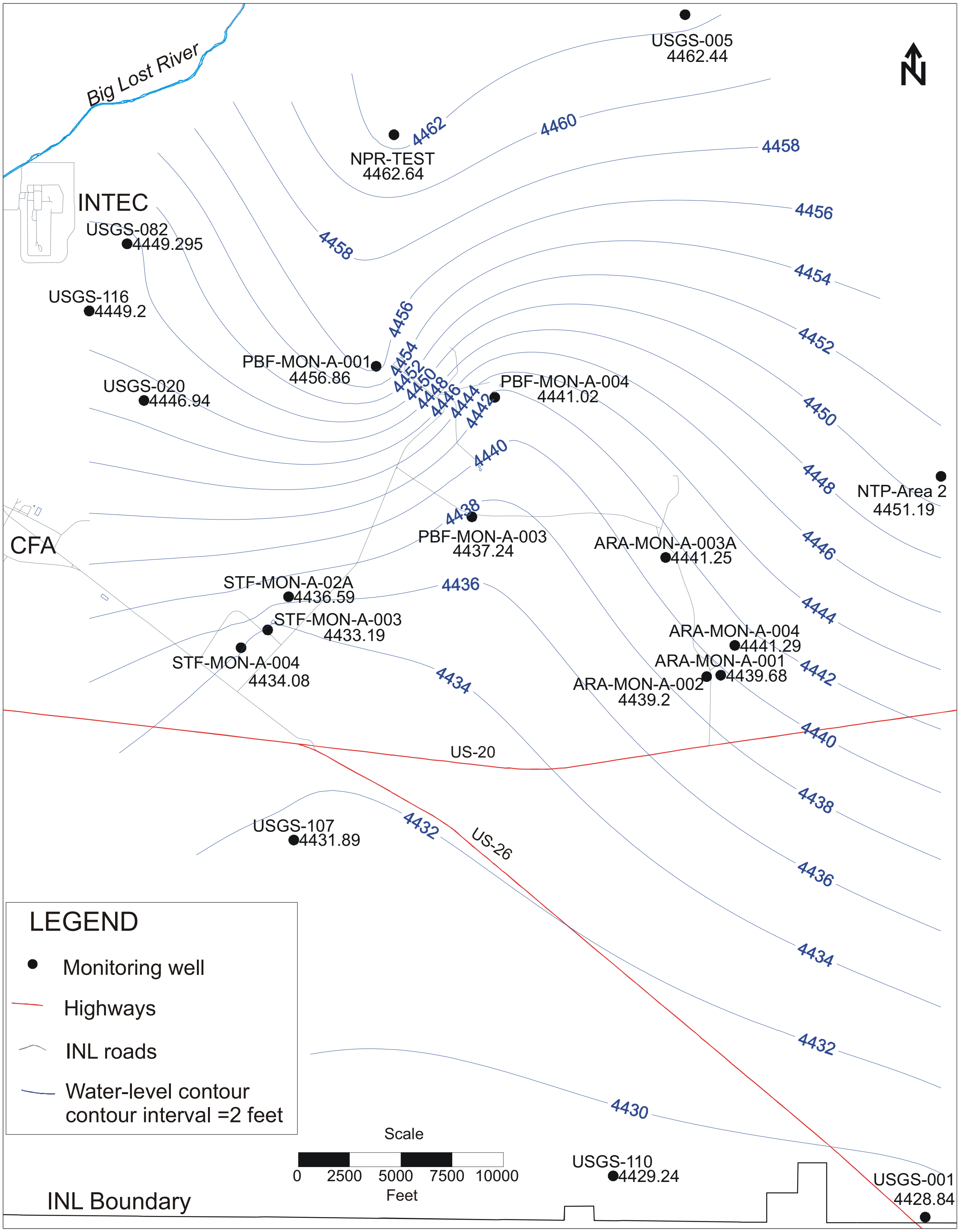

Figure 4-2. Waste Area Group 5 groundwater contour map of June 2004 data.

Iodine-129, tritium, and gamma-emitting radionuclides occasionally have been detected in samples collected in support of the WAG 5 groundwater monitoring, but the results are questionable because of the inconsistency with which they were detected and the fact that no ongoing activities exist at WAG 5 that would have contributed to their presence. Sporadic volatile organic contaminant detections also have occurred in WAG 5 groundwater samples, but not consistently.

Historically, lead has been detected at concentrations exceeding the EPA-defined action level of 15 μg/L. The cause of the historic elevated lead concentrations is believed to be the galvanized water-access and discharge pipes. Excluding the production well, SPERT-I, each of the WAG 5 groundwater monitoring wells was installed with galvanized water-access and discharge pipes. As part of the INL routine well maintenance program, the pumps were removed and maintained and galvanized pipes were removed and replaced with stainless-steel pipes in Wells ARA-MON-A-001 and PBF-MON-A-004 during June 2003. The galvanized pipe from all other WAG 5 monitoring wells has been replaced with stainless-steel pipe during well maintenance activities over the past few years. The galvanized pipe removed from these wells showed evidence of corrosion and rusting.

The presence of lead and zinc in groundwater samples from other wells at the INL, specifically wells in and around the Central Facilities Area and Test Area North, has been attributed to the corrosion of galvanized pipes. After the galvanized pipe was replaced with stainless-steel pipe in these other wells, the concentrations of lead and zinc decreased. Similarly, upon replacement of the galvanized pipe in the ARA and PBF wells, the lead concentrations decreased to background levels (see Figure 4-3). Consequently, the elevated lead levels in the ARA and PBF wells were probably the result of the corroded galvanized pipe in the wells.

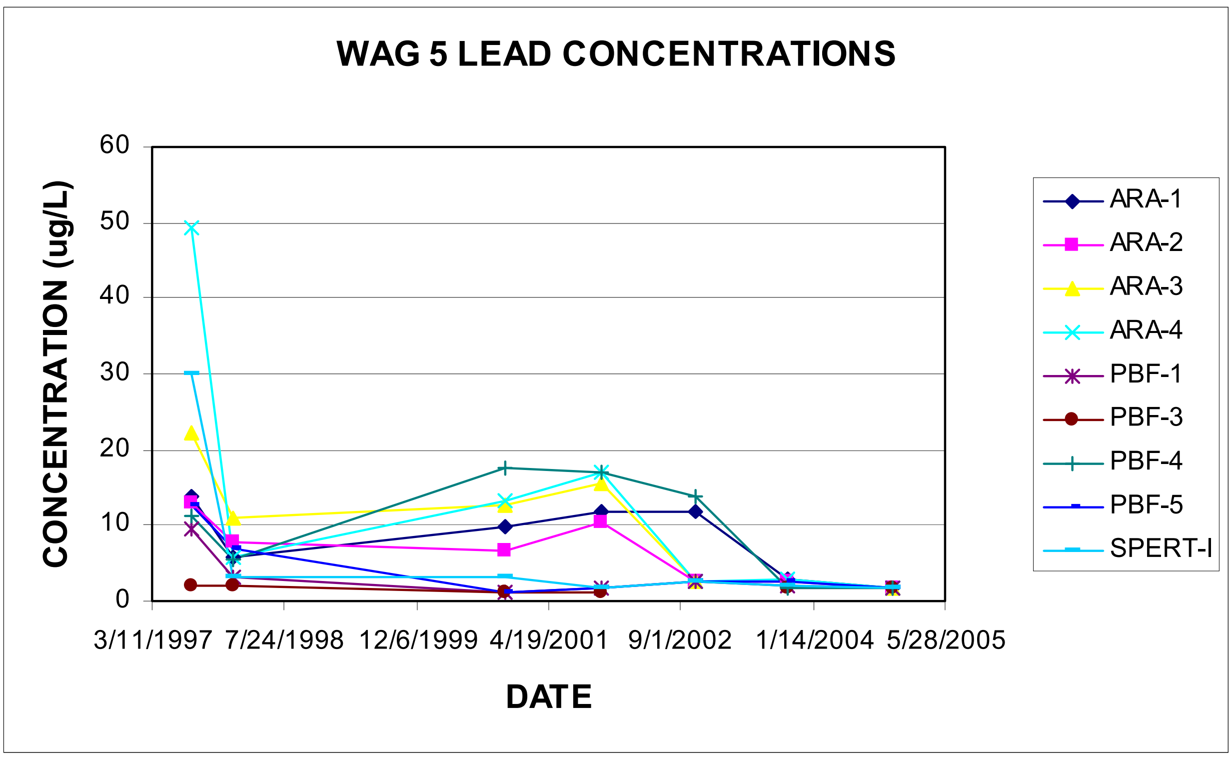

Figure 4-3. Waste Area Group 5 lead concentrations.

Annual WAG 5 groundwater monitoring conducted in support of the OU 5-12 ROD (DOE-ID 2000b) commenced in the fall of 2000 and has been performed every year since the signing of the ROD. The results of the first four rounds of sampling are summarized in the following reports:

- *FY 2001 Annual Groundwater Monitoring Trending Report for the Waste Area Group 5* (INEEL 2001a)
- *Annual Groundwater Monitoring Status Report for the Waste Area Group 5 for Fiscal Year 2002* (INEEL 2002a)
- *Annual Groundwater Monitoring Status Report for the Waste Area Group 5 for Fiscal Year 2003* (INEEL 2003a)
- *Annual Groundwater Monitoring Status Report for Waste Area Group 5 for Fiscal Year 2004* (ICP 2004)
- *Annual Groundwater Monitoring Status Report for Waste Area Group 5 for Fiscal Year 2005* (ICP 2005).

5. SITE-SPECIFIC OPERATIONS AND MAINTENANCE

Subsequent to the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000b), the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000a) was prepared. The Operations and Maintenance (O&M) Plan described the long-term operations and maintenance activities to be conducted at WAG 5 to ensure that the selected remedies identified in the OU 5-12 ROD (DOE-ID 2000b) remained protective of human health and the environment. Specifically, the O&M Plan (DOE-ID 2000a) provided for the implementation of institutional controls at the 15 sites discussed in Section 3. In addition, the O&M Plan provided for environmental monitoring at the WAG 5 sites in terms of performing surveys of the sites using field screening methods. This is particularly applicable to the ARA-06 site (ARA-II SL-1 Burial Ground), which consists of a buried waste site with an engineered barrier. For the ARA-01, ARA-02, ARA-12, ARA-16, and ARA-23 sites, the remedial action was effective in reducing contaminants of concern to levels below the remedial action goals, thereby negating the need for future monitoring of the sites. The remediation of the ARA-25 site removed contamination down to basalt, then the site was backfilled with clean soils. As such, no future monitoring of the ARA-25 site is necessary.

For the ARA-06 site, an estimated baseline risk from exposure to radiologically contaminated soil and waste of 1E-01 for the 100-year future residential scenario is applicable, while diminishing to 1E-04 in approximately 400 years. The remedial action consisted of the placement of an engineered barrier to mitigate these risks, with land-use controls being maintained to inhibit intrusion into the buried waste. The engineered barrier has two components including a biotic barrier and a human intrusion barrier. The biotic barrier consists of cobble between two layers of pea gravel that will inhibit intrusion of insects and small burrowing animals. The human intrusion barrier consists of large (61-cm [24-in.]) basalt boulders. A chain-link fence with a gate surrounds the burial ground and granite monuments engraved with universal warning symbols have been emplaced at the site.

Annual inspections have been performed at the SL-1 Burial Ground since the completion of the remedial inspection, with inspections being completed in accordance with the OU 5-12 ROD (DOE-ID 2000b) and OU 5-12 O&M Plan (DOE-ID 2000a) since Fiscal Year (FY) 2000. The engineered barriers at the SL-1 site are visually inspected for evidence of subsidence, erosion, intrusion, or other conditions that would indicate that the integrity of the barriers has been compromised. To date, the barriers at the site have appeared intact with no visible evidence of subsidence or erosion. Suitable habitat for small mammals common at the INL is present in the areas surrounding the covers and small mammals have been observed in the vicinity of the covers. Inspections have indicated that the integrity and effectiveness of the barriers remain intact.

In addition to the integrity of the engineered barriers, the SL-1 Burial Ground is inspected for vegetation growth and integrity of the institutional controls. An annual radiological survey is performed around the perimeters of the engineered covers using hand-held instruments to determine whether a change has occurred in the dose rates experienced around the barriers. To date, the exposure rates have been consistent with historic survey results.

The engineered covers for the SL-1 Burial Ground appear to be performing as designed, with no visual evidence of subsidence, erosion, or intrusion. Institutional controls at the site, which include fencing, signage, monuments, and protective barriers, appear to be effective in securing the site against unauthorized human intrusion. The revegetation effort (until the completion of the remedial action conducted at ARA-23) appeared to have been effective. The ARA-23 remedial action resulted in the removal of surficial contaminated soils within the perimeter fence surrounding the SL-1 Burial Ground without disturbing the engineered barrier. The revegetation effort completed in the fall of 2004 (following the ARA-23 remedial action) will be assessed in future years.

The annual inspections conducted from FY 2000 through FY 2003 are documented in the following reports. The report addressing the inspection conducted in FY 2004 is forthcoming.

- *2000 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds* (INEEL 2001b)
- *2001 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds* (INEEL 2001c)
- *2002 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds* (INEEL 2002b)
- *2003 Annual Inspection Summary for the Stationary Low-Power Reactor-1 Burial Ground* (INEEL 2003b).

Based upon annual inspection results demonstrating that the engineered barrier emplaced over the SL-1 Burial Ground is performing as designed, it will be recommended in the INL 5-year review to reduce the frequency of inspections.

6. CONCLUSIONS

The three main operations and maintenance activities conducted at WAG 5 have included following:

- Implementation and maintenance of institutional controls
- Performance of environmental monitoring activities, specifically the monitoring of groundwater
- Inspection and maintenance of the engineered barrier installed over the SL-1 Burial Ground.

Historically, institutional controls have been maintained in accordance with the institutional control plan that is included with the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000a). In the future, institutional controls will continue to be maintained in accordance with the requirements outlined in the *INEEL Sitewide Institutional Controls Plan* (DOE-ID 2004a), which has incorporated the salient requirements of the OU 5-12 O&M Plan. Similarly, the inspection and maintenance of the SL-1 Burial Ground engineered barrier that has been conducted in accordance with the OU 5-12 O&M Plan (DOE-ID 2000a) will be performed following the requirements of the *INEEL Sitewide Operations and Maintenance Plan for CERCLA Response Actions* (DOE-ID 2004c), which incorporates the operations and maintenance requirements for the SL-1 Burial Ground as outlined in the OU 5-12 O&M Plan. Groundwater monitoring will continue to be performed in accordance with the requirements delineated in the *Groundwater Monitoring Plan for the Waste Area Group 5 Remedial Action* (DOE-ID 2004b).

With the completion of the remedial actions at WAG 5 as required by the *Record of Decision–Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000b), the Idaho Cleanup Project's Long-Term Stewardship organization will assume responsibility to ensure that the WAG 5 O&M activities are conducted in accordance with the agreed-upon plans, and with the results being documented and reported to the Agencies in one annual Sitewide O&M report that consolidates the majority of the O&M activities being conducted for the various WAGs at INL. The prescribed activities will be performed until such time as they are discontinued based upon the recommendation contained in a 5-year review with concurrence of the Agencies.

7. REFERENCES

40 CFR 300, 2004, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, August 10, 2005.

42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code,* December 11, 1980.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Docket No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 1991.

DOE-ID, 1996, *Record of Decision: Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds (Operable Units 5-05 and 6-01) and 10 No Action Sites (Operable Units 5-01 5-03, 5-04, and 5-11)*, INEL-95/0282, U.S. Department of Energy Idaho Operations Office, March 1996.

DOE-ID, 1999, *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/ Feasibility Study*, DOE/ID-10607, Rev. 0, U.S. Department of Energy Idaho Operations Office, January 1999.

DOE-ID, 2000a, *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12*, DOE/ID-10805, Rev. 0, U.S. Department of Energy Idaho Operations Office, December 2000.

DOE-ID, 2000b, *Record of Decision–Power Burst Facility and Auxiliary Reactor Area*, DOE/ID-10700, Rev. 0, U.S. Department of Energy Idaho Operations Office, January 2000.

DOE-ID, 2004a, *INEEL Sitewide Institutional Controls Plan*, DOE/ID-11042, Rev. 1, U.S. Department of Energy Idaho Operations Office, June 2004.

DOE-ID, 2004b, *Groundwater Monitoring Plan for the Waste Area Group 5 Remedial Action*, DOE/ID-10779, Rev. 2, U.S. Department of Energy Idaho Operations Office, September 2004.

DOE-ID, 2004c, *INEEL Sitewide Operations and Maintenance Plan for CERCLA Response Actions*, DOE/NE-ID-11159, Rev. 0, U.S. Department of Energy Idaho Operations Office, September 2004.

DOE-ID, 2005a, *Remedial Action Report for the Operable Unit 5-12 Remedial Action*, DOE/NE-ID-11205, Rev. 0, U.S. Department of Energy Idaho Operations Office, July 2005.

DOE-ID, 2005b, *Explanation of Significant Differences for the Record of Decision for the Power Burst Facility and Auxiliary Reactor Area Operable Unit 5-12*, DOE-ID-11017, Rev. 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, January 2005.

EDF-ER-WAG5-104, 1997, "In Situ Gamma Radiation Survey at ARA-23 and ARA-24, Operable Unit 5-12, Waste Area Group 5," Idaho National Engineering and Environmental Laboratory, October 1997.

Fromm, J., 1996, "Radionuclide Risk-Based Concentration Tables," Letter to Waste Area Group Managers and Technical Support Staff, Idaho Department of Health and Welfare, Department of Environmental Quality, January 1996.

ICP, 2004, *Annual Groundwater Monitoring Status Report for Waste Area Group 5 for Fiscal Year 2004*, ICP/EXT-04-00369, Rev. 1, Idaho Completion Project, November 2004.

ICP, 2005, *Annual Groundwater Monitoring Status Report for Waste Area Group 5 for Fiscal Year 2005*, ICP/EXT-05-00901, Rev. 0, Idaho Cleanup Project, June 2005.

INEEL, 1995, *Remedial Investigation/Feasibility Study Report for Operable Units 5-05 and 6-01 (SL-1 and BORAX Burial Grounds)*, INEL-95/0027, Rev. 0, Idaho National Engineering and Environmental Laboratory, March 1995.

INEEL, 2001a, *FY 2001 Annual Groundwater Monitoring Trending Report for the Waste Area Group 5*, INEEL/EXT-01-00268, Rev. 0, Idaho National and Engineering Laboratory, April 2001.

INEEL, 2001b, *2000 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds*, Document ID: 21443, Rev. 0, Idaho National Engineering and Environmental Laboratory, May 2001.

INEEL, 2001c, *2001 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds*, EM-ER-01-077, Rev. 0, Idaho National Engineering and Environmental Laboratory, May 2001.

INEEL, 2002a, *Annual Groundwater Monitoring Status Report for the Waste Area Group 5 for Fiscal Year 2002*, INEEL/EXT-02-01032, Rev. 0, Idaho National Engineering and Environmental Laboratory, October 2002.

INEEL, 2002b, *2002 Annual Inspection Summary for Stationary Low-Power Reactor-1 and Boiling Water Reactor Experiment-I Burial Grounds*, Document ID: 23829, Rev. 0, Idaho National Engineering and Environmental Laboratory, August 2002.

INEEL, 2003a, *Annual Groundwater Monitoring Status Report for the Waste Area Group 5 for Fiscal Year 2003*, INEEL/EXT-03-00729, Rev. 0, Idaho National Engineering and Environmental Laboratory, September 2003.

INEEL, 2003b, *2003 Annual Inspection Summary for the Stationary Low-Power Reactor-1 Burial Ground*, INEEL/EXT-03-01126, Rev. 0, Idaho National Engineering and Environmental Laboratory, August 2003.

Parsons, 1995, *Final Remedial Action Report: Power Burst Facility (PBF)-08 Corrosive Waste Sump and PBF-10 Evaporation Pond Interim Action Operable Unit 5-13*, Rev. 3, Parsons Infrastructure and Technologies Group, Inc., March 1995.